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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,650	12/11/2003	Hyung Jun Kim	CU-3486 RJS	2168
26530	7590	06/01/2004		
LADAS & PARRY 224 SOUTH MICHIGAN AVENUE, SUITE 1200 CHICAGO, IL 60604				
			EXAMINER	
			LEE, CALVIN	
			ART UNIT	PAPER NUMBER
			2825	

DATE MAILED: 06/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/733,650

Applicant(s)

KIM, HYUNG JUN

Examiner

Lee, Calvin

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/11/03 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

OFFICE ACTION

Claim Rejections - 35 U.S.C. § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by *Curry, II et al* (US 5,137,597).

Curry, II et al discloses a method for polishing a copper layer, comprising the steps of:

- a) forming a first sacrificial layer pattern **14a** having a first trench **20a** on a substrate **12a** [Fig. 13a]
- b) continuously forming a first copper layer **24a** on a sidewall of the first trench, a bottom surface of the first trench, and the first sacrificial layer pattern [Fig. 14]
- c) polishing the first copper layer through a CMP process [Fig. 15]
- d) removing the first sacrificial layer pattern to a height of the first copper layer formed on the bottom surface of the first trench, thereby forming trench structure having the first trench filled with the first copper layer [Fig. 16]
- e) forming a second sacrificial layer pattern **14c** having a second trench, which exposes the trench structure, on the first sacrificial layer pattern **14a** having the trench structure [col. 5, ln.66]
- f) continuously forming a second copper layer **24c** on a sidewall of the second trench, a bottom surface of the second trench, and the second sacrificial layer pattern [Fig. 19], wherein the first and second copper layers are formed by electroplating techniques [col. 1, ln.37]
- g) removing the second copper layer to expose a surface of the second sacrificial layer pattern

Curry, II et al also discloses that the CMP process carries out under a polishing pressure of 6psi at a polishing rate of “17 microns ... in 10 minutes” (that is 17,000Å/min with respect the copper layer, thereby exposing a surface of the sacrificial layer pattern of polyimide [col. 5, ln.55].

Claim Rejections - 35 U.S.C. § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2-3 and 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Curry, II et al*, as applied to claims 1 and 4, in view of *Tsuchiya et al* (US 6,530,968).

a) *Curry, II et al* suggests carrying out the CMP process under a polishing pressure of 6psi, but not of between 0.1 to 2psi.

It would have been obvious to one having ordinary skill in the art to have modified the polishing pressure of *Curry, II et al* by utilizing the claimed polishing pressure because one would adjust polishing rotation speed and pressure to result in the most effective polishing process.

b) *Curry, II et al* suggests Baikalex and/or Rodel slurry, but not the slurry including polycarboxylate polymer. *Tsuchiya et al* teaches a slurry containing a thickener of polycarboxylate polymer [Abstract and claim 12 in *Tsuchiya et al*].

It would have been obvious to one having ordinary skill in the art to have modified the fabricating method of *Curry, II et al* by utilizing a slurry including polycarboxylate polymer for the purpose of forming an interconnect with excellent properties at a higher polishing rate.

5. Claims 6 and 9-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Curry, II et al* in view of *Kunishima et al* (US 2004/0014312).

Curry, II et al teaches inter-layer connections by filling inter-layer holes or vias with a copper material [col. 1, ln.20]. However, *Curry, II et al* is silent about first and second copper seed layers. Nevertheless, such interconnect with plating copper layers having their underlying copper seed layers is known in the semiconductor processing art as evidenced by *Kunishima et al* disclosing first and second copper seed layers 24a and 30 underlying their respective copper layers 66a and 32 [page 8], and sequentially removing the second copper layer 32 and the second copper seed layer 30 to expose a surface of a second sacrificial layer pattern 18 [Fig. 5].

It would have been obvious to one having ordinary skill in the art to have modified the interconnect of *Curry, II et al* by utilizing extra copper seed layers for the purpose of reducing diffusion of copper ions from the overlying copper interconnects.

6. Claims 8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Curry, II et al* and *Kunishima et al*, as applied to claim 6, in view of *Tsuchiya et al* (US 6,530,968).

a) *Curry, II et al* suggests carrying out the CMP process at a polishing pressure of 6psi, but not of between 0.1 to 2psi.

It would have been obvious to one having ordinary skill in the art to have modified the polishing pressure of *Curry, II et al* by utilizing the claimed polishing pressure because one would adjust polishing rotation speed and pressure to result in the most effective polishing process.

b) The combination of *Curry, II et al* and *Kunishima et al* does not suggest a slurry including polycarboxylate polymer. *Tsuchiya et al* teaches a slurry containing a thickener of polycarboxylate polymer [Abstract and claim 12 in *Tsuchiya et al*].

It would have been obvious to one having ordinary skill in the art to have modified the fabricating method of *Curry, II et al* by utilizing a slurry including polycarboxylate polymer for the purpose of forming an interconnect with excellent properties at a higher polishing rate.


Contact Information

7. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896, Monday to Thursday, from 7 to 5 (ET). If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2825's Supervisory Patent Examiner *Matthew Smith* whose telephone number is (571) 272-1907.

Any inquiry relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0596. The fax phones are (703) 872-9318 for regular communications and (703) 872-9319 for After-Final communications.

CU

May 25, 2004


CARIDAD EVERHART
PRIMARY EXAMINER